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Green Apartheid: Urban green infrastructure remains unequally distributed across income and race geographies in South Africa

Zander S. Venter[a,*], Charlie M. Shackleton[b], Francini Van Staden[c], Odirilwe Selomane[d], Vanessa A. Masterson[e]

[a] Terrestrial Ecology Section, Norwegian Institute for Nature Research – NINA, 0349 Oslo, Norway
[b] Department of Environmental Science, Rhodes University, Makhanda 6140, South Africa
[c] Department of Environmental Affairs and Development Planning, Western Cape Government, South Africa
[d] Centre for Complex Systems in Transition, Stellenbosch University, South Africa
[e] Stockholm Resilience Centre, Stockholm University, Stockholm 10691, Sweden

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ABSTRACT

Urban green infrastructure provides ecosystem services that are essential to human wellbeing. A dearth of national-scale assessments in the Global South has precluded the ability to explore how political regimes, such as the forced racial segregation in South Africa during and after Apartheid, have influenced the extent of and access to green infrastructure over time. We investigate whether there are disparities in green infrastructure distribution across race and income categories in urban South Africa. Using open-source satellite imagery and geographic information, along with national census statistics, we find that public and private green infrastructure is more abundant, greener, greener and more treed in high-income relative to low-income areas, and in areas where previously advantaged racial groups (i.e. White citizens) reside. Areas with White residents report 6-fold higher income, have 11.7% greater tree cover, 8.9% higher vegetation greenness and live 700 m closer to a public park than areas with predominantly Black African, Indian, and Coloured residents. The inequity in neighborhood greenness levels has been maintained (for Indian and Coloured areas) and further entrenched (for Black African areas) since the end of Apartheid in 1994 across the country. We also find that these spatial inequities are mirrored in both private (gardens) and public (street verges, parks, green belts) spaces, hinting at the failure of governance structures to plan for and implement urban greening initiatives. By leveraging open-access remote data and methods presented here, there is scope for civil society to monitor urban green infrastructure over time and thereby hold governments accountable to addressing environmental justice imperatives in the future. Interact with the data here: green-apartheid.nrf.ac.za.

1. Introduction

Green space and green infrastructure in cities and towns are increasingly recognized as crucial in any urban planning or policy strategy to promote urban sustainability, climate resilience and liveability. Positive relationships between urban greenery (e.g. parks, street trees) and many aspects of human wellbeing have been established. Ecosystem services and benefits derived from green infrastructure include improvement of air quality, amelioration of the urban heat island effect, carbon sequestration, water infiltration for recharging aquifers, and providing food and habitat for other biodiversity in the urban matrix (du Toit et al., 2018; Lindley et al., 2006; Lovell & Taylor, 2013; Venter et al., 2020). These services provide indirect societal benefits through improvement in physical and psychological health, social cohesion, sense of place, safety and livelihood needs (such as firewood, wild foods and traditional medicines in some African countries) to mention just a few (du Toit et al., 2018; Nesbitt et al., 2017; Rojas-Rueda et al., 2016; Twohig-Bennett and Jones, 2018). However urban green spaces and the benefits they provide are disproportionately available to some (Ernstson, 2013; Walch, Byrne, & Newell, 2014).

As a way to highlight the multiple functions of urban green space, alongside gray infrastructure that denotes the concrete, steel and asphalt structures that dominate urban ecosystems, the term 'urban green infrastructure' is progressively gaining traction in urban planning domains. Although a number of definitions of green infrastructure are in use, most include the same elements highlighted by Kambites and Owen

* Corresponding author at: Norwegian Institute for Nature Research, Gaustadalléen 21, NO-0349 Oslo, Norway.
E-mail address: zander.venter@nina.no (Z.S. Venter).

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